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75622.P0007 Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BOARD OF PATENT APPEALS AND INTERFERENCES

In Re Application of:

Jerrell P. Hein

Application No: 09/441,380

Filed: November 16, 1999

For: METHOD AND APPARATUS FOR MONITORING SUBSCRIBER LOOP INTERFACE CIRCUITRY POWER DISSIPATION

Examiner: Singh, Ramnandan P.

Art Unit: 2644

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Appeal Brief Under 37 C.F.R. § 41.37

Applicant (Appellant) respectfully submits this brief in support of an appeal from the Examiner's Final Office Action dated August 11, 2004 that finally rejected claims 1-12. Appellant respectfully requests consideration of this Appeal by the Board of Patent Appeals and Interferences for allowance of the above-referenced application.

The Brief is nominally required to be filed within two months from the date of receipt of the Notice of Appeal (MPEP § 512). The Office stamped a receipt date of January 14, 2005 on Appellant's return postcard thus establishing a due date of March 14, 2005. A petition for a two month extension of time accompanies this brief. The petition extends the time period for response until May 14, 2005. Given that May 14, 2005 falls on a Saturday, appellant respectfully submits that this Brief is timely filed when filed on or before the next business day of May 16, 2005 as indicated by the certificate of mailing above.

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I. REAL PARTY IN INTEREST

The above-identified application for patent is assigned to Silicon Laboratories, Inc., the real party in interest. Silicon Laboratories, Inc. is a Delaware corporation having a principal place of business at 4635 Boston Lane, Austin, Texas 78735.

II. RELATED APPEALS AND INTERFERENCES

Appellant is unaware of any other related appeals or interferences that may directly affect or be directly affected by or have a bearing on the Board's decision in this pending appeal.

III. STATUS OF THE CLAIMS

Claims 1-16 are pending. Claims 13-16 are allowed. Claims 1-8 are rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 4,355,341 of Kaplan ("Kaplan") in view of U.S. Patent No. 5,881,130 of Zhang ("Zhang"). Claims 9-12 were rejected as being unpatentable over Kaplan in view of Zhang and U.S Patent No. 5,488,631 of Gold ("Gold").

IV. STATUS OF AMENDMENTS

No amendments have been submitted in response to the Final Office Action dated August 11, 2004.

V. SUMMARY OF THE INVENTION

A. Overview

Subscriber line interface circuits are typically found in the central office exchange of a telecommunications network. A subscriber line interface circuit (SLIC) provides a communications interface between the digital switching network of a central office and an analog subscriber line. The analog subscriber

line connects to a subscriber station or telephone instrument at a location remote from the central office exchange. The analog subscriber line and subscriber equipment form a subscriber loop.

The interface requirements of a SLIC typically result in the need to provide relatively high voltages and currents for control signaling with respect to the subscriber equipment on the subscriber loop. A thermal alarm condition may occur if the semiconductor junction of a linefeed component (a subscriber line driver) exceeds a pre-determined temperature. Different linefeed components may have distinct thermal alarm thresholds. In order to determine the semiconductor junction temperature of a linefeed component, the instantaneous power dissipation of the linefeed component is estimated. The estimated instantaneous power dissipation is filtered to generate an estimated junction temperature of the linefeed component.

B. Summary of Claim 1

Claim 1 is drawn to a method for estimating a junction temperature of a linefeed component of a subscriber loop. At least one of a tip and a ring signal are sampled to determine a line voltage and a line current of the subscriber loop. An instantaneous power dissipation of the linefeed component is estimated using the sampled line voltage and sampled line current. The estimated instantaneous power dissipation is filtered to generate the estimated junction temperature of the linefeed component (Specification, p. 13, line 20 - p. 16, line 17; p. 17, lines 4-12; claim 1 as originally filed; Figs. 5, 6, 7)

C. Summary of Claim 5

Claim 5 is drawn to a method for estimating a junction temperature of a *selected* linefeed component of a subscriber loop. (Specification, p. 16, line 18 - p. 17, line 3). A linefeed component is selected from a plurality of linefeed components coupled to a subscriber loop. At least one of the subscriber loop tip and ring signals is sampled to determine a voltage and a current associated with the selected linefeed component. An instantaneous power dissipation of the

selected linefeed component is estimated using the associated voltage and current. The estimated instantaneous power dissipation is filtered to generate an estimated junction temperature of the selected linefeed component (Specification, p. 13, line 20 - p. 16, line 17; p. 17, lines 4-12; claim 5 as originally filed; Figs. 5, 6, 7).

D. Summary of Claim 7

Claim 7 is drawn to an apparatus for estimating the junction temperature of a selected linefeed driver component of a subscriber loop. The apparatus includes an analog-to-digital converter (ADC 520) for sampling at least one of a tip and a ring signal. A power calculator (540) is coupled to calculate an instantaneous power dissipation of a selected linefeed driver component from a plurality of linefeed driver components. The instantaneous power is calculated from the sampled signal and control currents provided to the plurality of linefeed driver components. A filter (550) provides an estimated junction temperature of the selected linefeed driver component from the instantaneous power dissipation. (Specification, p. 13, line 20 - p. 17, line 12; claim 7 as originally filed; Figs. 5, 6, 7).

VI. CHARACTERIZATION OF CITED REFERENCES

Zhang includes a disclosure of methods and apparatus for determining the presence of load coils attached to a telephone line. A stimulus waveform comprised of the sum of samples of sine waves of various frequencies is applied to the telephone line. The current and voltage of the line are sampled and a Fourier transform is performed to enable computing auto and cross power spectra of the current and voltage. The power spectra are used to compute the line impedance as a function of frequency. Peaks or sign changes in the line impedance are indicative of the presence of one or more load coils. (Zhang, col. 2, lines 29-46; col. 7, lines 18-37; col. 8, lines 53-67).

Kaplan includes a disclosure of a transistor protection circuit. The circuit monitors the product of output current and output voltage across the protected

transistor (Q_P). The circuit provides a feedback signal (34) to reduce the power dissipation of the protected transistor if the logarithm of this product exceeds a pre-determined limit. The logarithm (30) of the product is obtained by summing (18) voltages logarithmically related to each of the output voltage (V_{CE}) and output current (I_C) of the protected transistor. (Kaplan, col. 1, lines 42-61; col. 2, lines 4-38; Fig. 1)

Gold includes a disclosure of a wireless direct-sequence spread spectrum TDMA communications system. The communication system includes a Radio Connect Communication Engine (RCCE) that can be configured as a Master Unit (MU) or a Remote Unit (RU) transceiver. The RCCE includes a microprocessor (Gold, col. 8, lines 57-col. 9, line 40). The MU manages communications between RUs or between an RU and the MU in a network comprising an MU and a plurality of RUs. (Gold, col. 6, lines 50-55; Fig. 1)

VII. GROUNDS OF REJECTION TO BE REVIEWED UPON APPEAL

A. Whether claims 1-8 are unpatentable under § 103 in view of Kaplan and Zhang

B. Whether claims 9-12 are unpatentable under § 103 in view of any combination of Kaplan, Zhang, and Gold

VIII. ARGUMENT

A. Rejection of claims 1-8 under 35 U.S.C. § 103 (1-8)

1. Statement of Law

Claims 1-8 were rejected under 35 U.S.C. § 103 as being unpatentable over Kaplan in view of Zhang. In order to sustain a rejection under 35 U.S.C. § 103, three criteria must be met:

> *First,* there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. *Second,* there must be a reasonable expectation of success. *Finally,* the prior art reference (or references when combined) must teach

> or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure

(*In re Vaeck*, 20 USPQ2d 1438 (Fed. Cir. 1991)(*emphasis added*)

Appellant respectfully submits that the Examiner has failed to establish even a *prima facie* case of obviousness under 35 U.S.C. § 103 and therefore claims 1-8 were improperly rejected under 35 U.S.C. § 103 in view of the cited references.

2. ***No motivation to combine (claims 1-8)***

The Examiner has stated that the motivation for combining the references would have been "the ease to store digital data". The Examiner noted that analog data requires special devices for processing, storing and communication, and are unique to a specific application. The Examiner concludes that it would have been obvious to combine Zhang with Kaplan to estimate the instantaneous power of a linefeed component in a digital domain. The (08/11/2004 Office Action, p. 6)

Applicant submits Zhang teaches away from calculating an instantaneous power. (The *power spectrum* is a frequency domain expression that *is not equivalent to instantaneous power dissipation* - a time domain expression) Applicant notes that Zhang is concerned with detecting the presence and possibly the number of load coils that may be present on the subscriber line. Zhang is thus not concerned with determining instantaneous power dissipation or junction temperatures of linefeed components. The Examiner appears to be citing Zhang merely for the storing of sampled current and voltage signals for later processing.

Zhang requires the generation of stimulus waveforms in order to measure the power spectra to determine the presence of load coils. This is not performed during calibration rather than normal operation of the subscriber line. Kaplan's apparatus, on the other hand, is used during normal operation to determine if an instantaneous power dissipation has been exceeded.

These references are unrelated in purpose and would not be expected to operate during the same operational phases of subscriber loop communications. Indeed, Kaplan does not even teach or suggest use in a SLIC application. The Examiner appears to have arrived at this combination in hindsight after attempting to combine references in order to meet the elements of applicant's claims.

In short, the Examiner appears to be extracting only a processor coupled to a subscriber line from Zhang while ignoring the remainder of Zhang and *replacing* the circuitry of Kaplan in order to compute the instantaneous power dissipation in the digital domain. The Examiner has suggested that the circuit of Kaplan is not added to the microprocessor of Zhang. Instead Zhang's digital circuitry is "added" into Kaplan to estimate the instantaneous power dissipation in a digital domain instead of in the analog domain. (08/11/2004 Office Action, p. 3). Applicant submits that the Examiner seems to be suggesting *complete replacement* of the circuitry of Kaplan in favor of a digital solution *effectively destroying the teachings* of Kaplan.

At the very least, the principle of Kaplan would impermissibly be altered since there would no longer be a reliance on the logarithmic I-V relationship in the analog domain. Indeed, if a processor is available, the processor would just compute the product rather than computing and summing logarithms in the digital domain which would require considerably more steps and processing ability. The Examiner is not free to alter the principle of Kaplan in such a fashion.

3. *No reasonable expectation of success (claims 1-8)*

Contrary to the Examiner's assertions, Kaplan does not teach or disclose determining a semiconductor junction temperature. The temperature discussion cited by the Examiner merely acknowledges that the voltage across a semiconductor junction is temperature sensitive as a precaution to the practitioner. *Kaplan cautions the practitioner to maintain semiconductor junctions of transistors Q11, Q12, Q2 and Q14 at substantially the same temperature* to avoid the undesired effect of temperature variation between these components that would

otherwise affect the logarithmic proportionalities. (Kaplan, col. 4, lines 60- col. 5, line 2). This is not equivalent to determining the temperature of the junctions.

Kaplan calculates the logarithm of the instantaneous power dissipation by summing the logarithms of the current and the voltage across the protected transistor in an analog domain. As noted by Kaplan, the voltage across a semiconductor is proportional to the logarithm of the current and that such voltage is also proportional to temperature. By maintaining the temperature factor the same for the computational components providing inputs to a comparator, Kaplan *eliminates temperature* of the computational components as a concern when comparing logarithms of the instantaneous power and that of a threshold value. *Kaplan does not teach determining the junction temperature (esp. the junction temperature of the linefeed component/protected transistor) as alleged by the Examiner (see, e.g., 08/11/2004 Office Action, p. 5) Thus one could not reasonably expect the purported combination to generate an estimated junction temperature of the linefeed component.*

Applicant is uncertain as to how the Examiner finds the suggestion to combine Kaplan (an analog circuit with analog signals) with Zhang (stored values in digital form) to result in a teaching of calculating instantaneous power dissipation or calculated junction temperature. The Examiner has suggested that the circuit of Kaplan is not added to the microprocessor of Zhang. Instead Zhang's digital circuitry is "added" into Kaplan to estimate the instantaneous power dissipation in a digital domain instead of in the analog domain. (08/11/2004 Office Action, p. 3). Applicant submits that the Examiner seems to be suggesting *complete replacement* of the circuitry of Kaplan in favor of a digital solution *effectively destroying the teachings* of Kaplan.

The absurdity of this position is apparent when one realizes that Kaplan relies on the logarithmic relationship between current and voltage across a semiconductor junction in order to compute a logarithm proportional to instantaneous power dissipation using an adder to add logarithmic values for current and voltage in an analog domain. *If a processor were available, applicant*

submits that one would simply multiply the current and voltage across the protected transistor in order to compute the instantaneous power dissipation rather than computing and summing logarithms.

Is the Examiner proposing that the microprocessor compute the logarithm of the current and voltage and then sum them to achieve the same result as Kaplan? Given the goal of computing the product of current and voltage, implementing Kaplan's function in the digital domain would seem to require greater computational complexity than simply computing the product of the voltage and current digitally in the first place.

As noted above, the Examiner appears to be extracting only a processor coupled to a subscriber line from Zhang while ignoring the remainder of Zhang and *replacing* the circuitry of Kaplan in order to compute the instantaneous power dissipation in the digital domain. Applicant respectfully submits that such a contrivance is clearly impermissible hindsight and yet still fails to teach or disclose all the claimed limitations as detailed below.

4. *Combination of prior art references fails to teach or suggest all claim limitations*

a) *Filtering to generate estimated junction temperature (Claims 1, 5, 7)*

Applicant submits claims 1, 5, and 7 (and dependent claims 2-4, 6, and 8-12) may be addressed as a group with any of claims 1, 5, or 7 representative of the group for this argument. Applicant will address each of claims 1, 5, and 7 for completeness.

None of the cited references, alone or combined, teaches or suggests filtering the estimated instantaneous power dissipation to generate an estimated junction temperature of the linefeed component.

The Examiner has stated:

> Kaplan teaches computing an instantaneous power dissipation (ICxVCE) of transistor QP [Fig. 1; col. 2, lines 15-38], and that the voltage across the semiconductor is proportional to the logarithm of the current therethrough. *Kaplan further discloses determining the temperature of the*

> *semiconductor using the voltage across the semiconductor wherein voltage is proportional to temperature* [col. 4, lines 32-63; col. 6, lines 18-25].

(08/11/2004 Office Action, p. 2)(*emphasis added*)

Applicant traverses the Examiner's characterization of Kaplan. The temperature discussion cited by the Examiner merely acknowledges that the voltage across a semiconductor junction is temperature sensitive as a precaution to the practitioner. *Kaplan cautions the practitioner to maintain semiconductor junctions of transistors Q11, Q12, Q2 and Q14 at substantially the same temperature* to avoid the undesired effect of temperature variation between these components. (Kaplan, col. 4, lines 60- col. 5, line 2). These components are not linefeed components or the protected transistor. *Moreover, maintaining the same (unknown) temperature among a number of semiconductor devices is not equivalent to determining the temperature of their junctions, nor is it equivalent to determining the junction temperature of the linefeed component (protected transistor).*

Indeed *Kaplan does not teach determining the junction temperature of a linefeed component or protected transistor as alleged by the Examiner.* Applicant notes that the cited portion of Kaplan is drawn to eliminating the undesired effect of temperature variation on components providing inputs to the threshold detector (i.e. element 16). The temperature of Q11, Q12, Q2 and Q14, however, is wholly unrelated to the junction temperature of protected transistor QP which is a load driving device. Kaplan merely discloses that the transistors providing inputs to comparator should be maintained at the same temperature to ensure that they are similarly affected by temperature in order to cancel any temperature variation effects. (Kaplan, col. 4, line 44 through col. 5, line 9). At best Kaplan generates a logarithmic value proportional to the instantaneous power dissipation. *Kaplan does not filter the estimated instantaneous power dissipation to generate an estimated junction temperature of the linefeed component.*

Applicant submits that none of the cited references, alone or combined, teaches or suggests filtering the estimated instantaneous power dissipation to generate an estimated junction temperature of the linefeed component.

In contrast, claims 1, 5, and 7 include the language:

1. A method comprising the steps of:

a) sampling at least one of a tip and a ring signal to determine a line voltage and a line current of a linefeed component of a subscriber loop;

b) estimating an instantaneous power dissipation of the linefeed component using the sampled line voltage and sampled line current; and

c) *filtering the estimated instantaneous power dissipation to generate an estimated junction temperature of the linefeed component.*

(Claim 1)(*emphasis added*)

5. A method comprising the steps of:

a) selecting a selected linefeed component of a plurality of linefeed components coupled to a subscriber loop having a tip signal and ring signal;

b) sampling at least one of the tip and the ring signals to determine a voltage and a current associated with the selected linefeed component;

c) estimating an instantaneous power dissipation of the selected linefeed component using the associated voltage and current; and

filtering the estimated instantaneous power dissipation to generate an estimated junction temperature of the selected linefeed component.

(Claim 5)(*emphasis added*)

7. A subscriber loop signal processor apparatus, comprising:

an analog-to-digital converter (ADC) for sampling at least one of a tip and a ring signal;

a power calculator coupled to calculate an instantaneous power dissipation of a selected linefeed driver component from the sampled signal and control currents provided to a plurality of linefeed driver components; and

a filter providing an estimated junction temperature of the selected linefeed driver component from the instantaneous power dissipation.

(Claim 7)(*emphasis added*)

Thus applicant submits claims 1, 5, and 7 are patentable under 35 U.S.C. § 103 in view of the cited references. Given that claims 2-4 depend from claim 1, claim 6 depends from claim 5, and claims 7-12 depend from claim 8, applicant submits claims 2-4, 6, and 8-12 are likewise patentable under 35 U.S.C. § 103 in view of the cited references.

b. ***Selecting linefeed component from a plurality of linefeed components (Claims 5, 7)***

Applicant submits claims 5 and 7 (including dependent claims 6 and 8-12) may be addressed as a group with claim 5 representative of the group for this argument. Applicant will address each of claims 5 and 7 for completeness.

None of the cited references, alone or combined, teaches or suggests selectability of linefeed component for computation of the associated estimated junction temperature.

To the contrary, Zhang is coupled to the subscriber loop in order to infer characteristics such as load coils that may be attached to the subscriber line. Zhang appears to teach direct coupling to the subscriber loop and does not teach or suggest the ability to select between different linefeed components.

Kaplan is drawn to circuitry for determining the instantaneous power dissipation of a single transistor using analog circuitry. There is no provision for using the same circuitry to select among a plurality of transistors coupled to the same load, nor is there a provision for using the same circuitry to select among individual transistors each coupled to a different load. Thus Kaplan does not teach or suggest the ability to select between different linefeed components.

Thus none of the cited references, alone or combined, teaches or suggests selectability of linefeed component for computation of the associated estimated junction temperature.

In contrast, claims 5 and 7 include the language:

5. A method comprising the steps of:
a) *selecting a selected linefeed component of a plurality of linefeed components coupled to a subscriber loop having a tip signal and ring signal;*
b) sampling at least one of the tip and the ring signals to determine *a voltage and a current associated with the selected linefeed component;*
c) *estimating an instantaneous power dissipation of the selected linefeed component* using the associated voltage and current; and
d) filtering the estimated instantaneous power dissipation to *generate an estimated junction temperature of the selected linefeed component.*

(Claim 5)(*emphasis added*)

7. A subscriber loop signal processor apparatus, comprising:
an analog-to-digital converter (ADC) for sampling at least one of a tip and a ring signal;
a power calculator coupled to calculate an instantaneous power dissipation of *a selected linefeed driver component from the sampled signal and control currents provided to a plurality of linefeed driver components;* and
a filter *providing an estimated junction temperature of the selected linefeed driver component from the instantaneous power dissipation.*

(Claim 7)(*emphasis added*)

Applicant submits claims 5 and 7 are patentable under 35 U.S.C. § 103 in view of the cited references. Given that claim 6 depends from claim 5 and claims 8-12 depend from claim 7, applicant submits claims 6 and 8-12 are likewise patentable under 35 U.S.C. § 103 in view of the cited references.

B. Rejection of claims 9-12 under 35 U.S.C. § 103

1) Statement of Law

Appellant respectfully submits that if an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious. In re Fine 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

2) Reference cited only with respect to dependent claims

Claims 9-12 were rejected as being unpatentable over various combinations of Kaplan, Zhang, and Gold. Claims 9-12, however, all depend from claim 7. Appellant respectfully submits that Gold was not cited with respect to claim 7 and that claim 7 is patentable under 35 U.S.C § 103 in view of Kaplan and Zhang as discussed above. Gold was apparently only cited for the proposition of teaching a multiplexer. (see, e.g., 08/11/2004 Office Action, p. 7). Even then, appellant submits that at best Gold has referred to a processor capable of multiplexed high speed A/D conversion. There is no teaching or suggestion of selecting a linefeed component from a plurality of linefeed components associated with a single load nor is there any suggestion of selecting a linefeed component from a plurality of linefeed components each associated

with a different load (Kaplan only has a single load and a single driver, Zhang is directed to analyzing the load only and not any drivers). Thus even if the Examiner's analogy had merit, the combination still would not result in teaching or suggesting a selectable linefeed component or selecting a linefeed component from a plurality of linefeed components. Even if the Examiner disagrees, the dependency of claims 9-12 from claim 7 ensures that claims 9-12 are nonobvious so long as independent claim 7 is nonobvious.

Given that claim 7 is patentable for the reasons cited above and that claims 9-12 depend from claim 7, appellant respectfully submits that claims 9-12 are likewise patentable over the cited references.

X. CONCLUSION

Appellant respectfully submits that the stated rejections cannot be maintained in view of the arguments set forth above. Appellant respectfully requests that the Board of Patent Appeals and Interferences direct allowance of the rejected claims 1-12, such that all of claims 1-16 may proceed to allowance.

If there are any issues that can be resolved by telephone conference, the undersigned representative of the appellant may be contacted at **(512) 858-9910.**

Respectfully submitted,

Date: May 16, 2005

William D. Davis

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CLAIMS APPENDIX

The claims and their status are presented below.

1. (PREVIOUSLY PRESENTED) A method comprising the steps of:

a) sampling at least one of a tip and a ring signal to determine a line voltage and a line current of a linefeed component of a subscriber loop;

b) estimating an instantaneous power dissipation of the linefeed component using the sampled line voltage and sampled line current; and

c) filtering the estimated instantaneous power dissipation to generate an estimated junction temperature of the linefeed component.

2. (ORIGINAL) The method of claim 1 further comprising the step of:

d) generating a thermal alarm, if the estimated junction temperature exceeds an alarm threshold.

3. (ORIGINAL) The method of claim 2, further comprising the step of:

e) timesharing a same monitoring circuitry to perform steps a)-d) for each linefeed driver component being monitored.

4. (ORIGINAL) The method of claim 1 further comprising the step of:

d) programming a filter with filtering parameters corresponding to thermal characteristics of the linefeed component.

5. (PREVIOUSLY PRESENTED) A method comprising the steps of:

a) selecting a selected linefeed component of a plurality of linefeed components coupled to a subscriber loop having a tip signal and ring signal;

b) sampling at least one of the tip and the ring signals to determine a voltage and a current associated with the selected linefeed component;

c) estimating an instantaneous power dissipation of the selected linefeed component using the associated voltage and current; and

d) filtering the estimated instantaneous power dissipation to generate an estimated junction temperature of the selected linefeed component.

6. (ORIGINAL) The method of claim 5 further comprising the step of

e) providing a thermal alarm indicator, if the estimated junction temperature exceeds an alarm threshold.

7. (ORIGINAL) A subscriber loop signal processor apparatus, comprising:

an analog-to-digital converter (ADC) for sampling at least one of a tip and a ring signal;

a power calculator coupled to calculate an instantaneous power dissipation of a selected linefeed driver component from the sampled signal and control currents provided to a plurality of linefeed driver components; and

a filter providing an estimated junction temperature of the selected linefeed driver component from the instantaneous power dissipation.

8. (ORIGINAL) The apparatus of claim 7 further comprising:

a comparator providing an alarm indicator if the estimated junction temperature exceeds an alarm threshold.

9. (ORIGINAL) The apparatus of claim 7 further comprising:

a multiplexer coupling the at least one tip and ring signal to the analog-to-digital converter to enable providing an estimated junction temperature of any of the linefeed components using a same ADC, power calculator, and filter.

10. (ORIGINAL) The apparatus of claim 9 wherein a multiplexer control is time based to enable time-sharing the same ADC, power calculator, and filter for each linefeed component.

11. (ORIGINAL) The apparatus of claim 7 wherein the ADC, the power calculator, and the filter reside within a same integrated circuit package.

12. (ORIGINAL) The apparatus of claim 7 further comprising:

a re-writable nonvolatile memory coupled to provide filter parameters corresponding to thermal characteristics of the linefeed components to the filter.

13. (PREVIOUSLY PRESENTED) A subscriber loop interface circuit apparatus comprising:

a signal processor having sense inputs for receiving a sensed tip signal and a sensed ring signal from a tip line and a ring line of a subscriber loop, the signal processor generating subscriber loop control signals; and

a linefeed driver for driving the subscriber loop in accordance with the subscriber loop control signals, the linefeed driver including a tip fuse series-coupled to the tip line and a ring fuse series-coupled to the ring line, wherein the sensed tip signal includes first and second sampled tip voltages sampled from opposing sides of the tip fuse, wherein the sensed ring signal includes first and second sampled ring voltages sampled from opposing ends of the ring fuse.

14. (ORIGINAL) The subscriber loop linefeed driver of claim 13 wherein a difference between the first and second sampled tip voltages is proportional to the tip current, wherein a difference between the first and second sampled ring voltages is proportional to the ring current.

15. (ORIGINAL) A method comprising the steps of:

generating subscriber loop control signals in response to a sensed tip signal and a sensed ring signal of a subscriber loop, wherein the tip signal is sensed before and after a tip fuse, wherein the ring signal is sensed before and after a ring fuse; and

driving the subscriber loop in accordance with the subscriber loop control signals.

16. (ORIGINAL) A subscriber loop interface circuit apparatus comprising:

a signal processor having sense inputs for sensing a tip line and a ring line of a subscriber loop, the signal processor generating subscriber loop control signals; and

a linefeed driver for driving the subscriber loop in accordance with the subscriber loop control signals, the linefeed driver including a tip fuse series-coupled to the tip line and a ring fuse series-coupled to the ring line, wherein the tip line and ring line are each sensed at two locations to determine both a status of each fuse and a power dissipation of each linefeed driver component.

EVIDENCE APPENDIX

No additional evidence has been entered by the Examiner and relied upon by the appellant. Thus this appendix is not applicable.

RELATED PROCEEDINGS APPENDIX

Appellant is unaware of any other related appeals or interferences that may directly affect or be directly affected by or have a bearing on the Board's decision in this pending appeal. Thus this appendix is not applicable.